# Test Data Optimization Method for TTCN-3

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During the testing of telecommunication protocols it is indispensable to describe complex data structures, because these protocols communicate via a lot of large and complicated messages. In practice, tests and test data are defined in formal languages designed specifically for testing purposes (e.g. TTCN-3 [1], TTCN [2], MSC [3]). The executable test suites are produced from these specifications by the help of a compiler. Consequently, the properties of the resulting executable test set strongly depend on the quality of the source formal description. For example, if the test data definitions are lengthy and redundant in a formal specification, the executable test suite will be larger (and the compilation process will take longer as well) than the one produced from a redundancy-free specification. Furthermore, the way the test data are defined also influences the run-time speed.

Test data specifications can be created either in a manual or in an automatic way, but in neither case is the result optimal, since developers cannot cope with the enormous number of huge data structures, and automatic methods focus primarily on the generation problem. According to our empirical experiences test data definition occupies at least 60-70 percent of a complete test specification and they are highly redundant, therefore by eliminating the redundant and unused data structures the quality of the specification (and the quality of the executable test suite accordingly) can be significantly improved. Related work mainly concentrate on relational databases and test data compression, but as far as we know, not much has been done in the field of test data re-engineering. In our presentation, we introduce an optimization algorithm that can be applied without human intervention to test data defined in TTCN-3.

TTCN-3 is a universal and standardized language for testing distributed systems. This language has a special language element, the template, that provides sophisticated means for describing test data. Templates are used either to transmit a set of distinct values or to test whether a set of received values match the template specification. Moreover, they offer powerful data specification formalism including parameterization and inheritance.

Our main goal is to transform an already existing TTCN-3 test data specification, so that the derived executable test suite becomes more compact, redundancy-free and it has improved run-time characteristics. Naturally, the alterations preserve semantic correctness, only syntactical changes are introduced. In fact, the transformation is a high level reengineering method that operates on the formal description of a test suite, therefore it can optimize the module much more efficiently than any optimization technique that works on a lower level (e.g. on the implementation level). However our method is proposed specifically for TTCN-3, with slight modifications it can be extended, and applied to other similar languages.

## References

[1] Methods for Testing and Specification (MTS); The testing and Test Control Notation Version 3; Part1: TTCN-3 Core Language. ETSI ES 201 873-1 V2.2.0 (2002-03).

[2] Information Technology - Conformance testing methodology and framework; Part 3: The Tree and Tabular Combined Notation (TTCN). ISO 9646-3.

[3] Message Sequence Chart. ITU-T Recommendation Z.120.